

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

## CLAIMS

1. A method for building three-dimensional objects, said method comprising:  
dispensing a first material used to form at least the three-dimensional object;  
5 dispensing a second material used to form at least part of a support structure;  
and  
dispensing a third material between said 3-D object and said support structure to  
form a release layer.

10 2. The method of claim 1 wherein at least said first material is a photopolymer  
and at least the three-dimensional object is formed after being irradiated by  
electromagnetic radiation.

15 3. The method of claim 1 wherein said second material is a photopolymer and  
the support structure is formed after being irradiated by electromagnetic radiation.

4. The method of claim 1 wherein said third material is a photopolymer and the  
release layer is formed after being irradiated by electromagnetic radiation.

20 5. The method of claim 1 wherein said support structure comprises said first  
material.

25 6. The method of claim 1 wherein said second and third materials are the  
same substance.

7. The method of claim 1 wherein said release layer is softer than said  
support structure, and said support structure is softer than said 3-D object.

30 8. The method of claim 1 comprising separating said support structure and  
release layer from said 3-D object thereby to produce a three dimensional object  
comprised of said first material.

9. The method according to claim 1, comprising subjecting said second material to a solvent or to radiation thereby to cause the support structure to weaken.

5 10. The method according to claim 1, wherein said support structure and release layer are at least partly liquid or paste after curing.

11. The method according to claim 1, where said support structure comprises a container capable of confining said support material.

10 12. The method according to claim 1, further comprising constructing at least one support pillar of said first material within said support structure.

13. The method according to claim 12, further comprising constructing at least one connecting membrane of first material attached to said at least one support pillar.

14. A system for building three-dimensional objects, said system comprising:

a controller; and

a jetting head capable of selectively dispensing:

20 a first material used to form at least the three-dimensional object;

a second material used to form at least part of a support structure;

and

a third material between said 3-D object and said support structure used to form a release layer.

25 15. The system of claim 14 wherein at least said first material is a photopolymer and at least the three-dimensional object is formed after being irradiated by electromagnetic radiation.

30 16. The system of claim 14 wherein said second material is a photopolymer and the support structure is formed after being irradiated by electromagnetic radiation.

17. The system of claim 14 wherein said third material is a photopolymer and the release layer is formed after being irradiated by electromagnetic radiation.

5 18. The system of claim 14 wherein said support structure comprises said first material.

19. The system of claim 14, wherein said support structure and release layer are at least partly liquid or paste after curing.

10 20. The system of claim 14, where said support structure comprises a container capable of confining said support material.

15 21. A method for building three-dimensional objects, said method comprising:  
dispensing a curable build material to form the 3-D object and part of the support structure;

dispensing a support material to form part of the support structure, the build material being solid after curing and the support material being liquid after curing; and

20 forming a support structure comprising a container capable of holding said support material.

22. The method according to claim 21, wherein said container comprises a base, a plurality of walls and an open top.

25 23. The method according to claim 21, wherein said container comprises at least one nib projecting from at least one of said walls, wherein said at least one nib is capable of restraining the movement of a three dimensional object.

30 24. The method according to claim 21, wherein said container comprises build material.

25. The method according to claim 21, wherein each of said build material, support material and container are formed in layers.

5 26. A system for building three-dimensional objects, said system comprising:  
a controller; and  
a material dispenser capable of dispensing:  
a curable build material to form the 3-D object and part of a support  
structure; and  
10 a support material to form part of the support structure, the build material  
being solid after curing and the support material being liquid after curing;  
wherein the material dispenser is capable of forming a support structure  
comprising a container capable of holding said support material.

15 27. The system according to claim 26, wherein said container comprises a  
base, a plurality of walls and an open top.

20 28. The system according to claim 26, wherein said container comprises at  
least one nib projecting from at least one of said walls, wherein said at least one nib is  
capable of restraining the movement of a three dimensional object.

29. The system according to claim 26, wherein said container material is  
identical to said build material.

25 30. The system according to claim 26, wherein each of said build material,  
support material and container material are deposited in layers.

31. A method for building three-dimensional objects, said method comprising:  
dispensing a build material;  
30 dispensing a second material forming a support structure; and

constructing a support pillar to support an object comprised of said build material.

32. The method according to claim 31, comprising constructing membranes  
5 connected to said support pillar.

33. The method according to claim 31, wherein said at least one support pillar is comprised of said build material.

10 34. The method according to claim 31, wherein said at least one support pillar is comprised of said build material and said second material.

15 35. The method according to claim 31, wherein said at least one support pillar comprises a plurality of layers and wherein the topmost layer of said at least one support pillar is adjacent to an object being supported.

36. The method according to claim 31, wherein said upper portion of said at least one support pillar is tapered.

20 37. The method according to claim 31, wherein each of said build material, second material and pillar are deposited in layers.

25 38. The method according to claim 31, wherein the topmost layer of said at least one support pillar comprises said second material.

39. The method according to claim 31, wherein the topmost layer of said at least one support pillar comprises a third material, said third material being softer than the material forming the remainder of said at least one support pillar.

30 40. A system for building three-dimensional objects, said system comprising:  
dispenser capable of dispensing:

a build material;  
second material forming a support structure; and  
said dispenser constructing a support pillar to support an object comprised of  
said build material.

5           41.    The system according to claim 40, wherein said dispenser is capable of  
material forming dispensing constructing membranes connected to said support pillar.

10           42.    The system according to claim 40, wherein said at least one support pillar  
is comprised of said build material.

          43.    The system according to claim 40, wherein said at least one support pillar  
is comprised of said build material and said second material.

15           44.    The system according to claim 40, wherein said at least one support pillar  
comprises a plurality of layers and wherein the topmost layer of said at least one  
support pillar is adjacent to an object being supported..

20           45.    The system according to claim 40, wherein the topmost layer of said at  
least one support pillar comprises said second material.

          46.    The system according to claim 40, wherein the topmost layer of said at  
least one support pillar comprises a third material, said third material being softer than  
the material forming the remainder of the pillar.

25           47.    The system according to claim 40, wherein said upper portion of said at  
least one support pillar is tapered.

30           48.    The system according to claim 40, wherein each of said build material,  
second material and pillar are deposited in layers.

49. A method for building three-dimensional objects, said method comprising:  
dispensing a first material for the construction of the three-dimensional object;  
dispensing a support material forming a support structure for supporting said  
three-dimensional object; and  
5 inserting a support insert.

50. The method of claim 49 wherein the support insert comprises a third material.

10 51. The method of claim 49 wherein the support insert includes plastic.

52. The method of claim 49 wherein the support insert includes metal.

15 53. The method of claim 49 wherein the support insert is a plate shaped member.

54. The method of claim 49 wherein the support insert is a skewed member.

20 55. The method of claim 49 wherein the support insert includes at least threads.

56. The method of claim 49 wherein the support insert is flexible.

25 57. The method of claim 49 wherein the support insert is more rigid than the support material, after said support material is cured.

58. A system for building three-dimensional objects, said system comprising:  
a build material jetting means for dispensing build material;  
a support material jetting means for dispensing support material; and  
30 a release material jetting means for dispensing release material between said built and support materials.



59. A system for building three-dimensional objects, said system comprising:  
a controller means;

a material dispenser means for dispensing:

5 build material having a first modulus of elasticity;

container material having a second modulus of elasticity; and

support material having a third modulus of elasticity and being held in a  
container comprised of said container material.

10 60. A system for building three-dimensional objects, said system comprising:

a dispenser means for dispensing:

a build material;

a second material forming a support structure; and

said dispenser means constructing a support pillar to support an object

15 comprised of said build material.